RIGOL
Service Guide

MSO8000 Series Digital Oscilloscope

Jul. 2019
RIGOL (SUZHOU) TECHNOLOGIES INC.

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Publication Number
SGA26102-1110

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If you have any problem or requirement when using our products or this manual, please contact **RIGOL**.
E-mail: service@rigol.com
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Safety Requirement

General Safety Summary

Please review the following safety precautions carefully before putting the instrument into operation so as to avoid any personal injury or damage to the instrument and any product connected to it. To prevent potential hazards, please follow the instructions specified in this manual to use the instrument properly.

Use Proper Power Cord.
Only the exclusive power cord designed for the instrument and authorized for use within the local country could be used.

Ground the Instrument.
The instrument is grounded through the Protective Earth lead of the power cord. To avoid electric shock, connect the earth terminal of the power cord to the Protective Earth terminal before connecting any input or output terminals.

Connect the Probe Correctly.
If a probe is used, the probe ground lead must be connected to earth ground. Do not connect the ground lead to high voltage. Improper way of connection could result in dangerous voltages being present on the connectors, controls or other surfaces of the oscilloscope and probes, which will cause potential hazards for operators.

Observe All Terminal Ratings.
To avoid fire or shock hazard, observe all ratings and markers on the instrument and check your manual for more information about ratings before connecting the instrument.

Use Proper Overvoltage Protection.
Ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the operator might be exposed to the danger of an electric shock.

Do Not Operate Without Covers.
Do not operate the instrument with covers or panels removed.

Do Not Insert Objects Into the Air Outlet.
Do not insert anything into the holes of the fan to avoid damaging the instrument.

Use Proper Fuse.
Please use the specified fuses.

Avoid Circuit or Wire Exposure.
Do not touch exposed junctions and components when the unit is powered on.

Do Not Operate With Suspected Failures.
If you suspect that any damage may occur to the instrument, have it inspected by **RIGOL** authorized personnel before further operations. Any maintenance, adjustment or replacement especially to circuits or accessories must be performed by **RIGOL** authorized personnel.

Provide Adequate Ventilation.
Inadequate ventilation may cause an increase of temperature in the instrument, which would cause damage to the instrument. So please keep the instrument well ventilated and inspect the air outlet and the fan regularly.

Do Not Operate in Wet Conditions.
To avoid short circuit inside the instrument or electric shock, never operate the instrument in a humid environment.

Do Not Operate in an Explosive Atmosphere.
To avoid personal injuries or damage to the instrument, never operate the instrument in an explosive atmosphere.

Keep Product Surfaces Clean and Dry.
To avoid dust or moisture from affecting the performance of the instrument, keep the surfaces of the instrument clean and dry.

Prevent Electrostatic Impact.
Operate the instrument in an electrostatic discharge protective environment to avoid damage induced by static discharges. Always ground both the internal and external conductors of cables to release static before making connections.

Use the Battery Properly.
Do not expose the battery (if available) to high temperature or fire. Keep it out of the reach of children. Improper change of a battery (lithium battery) may cause an explosion. Use the **RIGOL** specified battery only.

Handle with Caution.
Please handle with care during transportation to avoid damage to keys, knobs, interfaces, and other parts on the panels.

Safety Notices and Symbols

Safety Notices in this Manual:

⚠ **WARNING**
Indicates a potentially hazardous situation or practice which, if not avoided, will result in serious injury or death.

⚠ **CAUTION**
Indicates a potentially hazardous situation or practice which, if not avoided, could result in damage to the product or loss of important data.

Safety Terms on the Product:

DANGER   It calls attention to an operation, if not correctly performed, could result in injury or hazard immediately.

WARNING   It calls attention to an operation, if not correctly performed, could result in potential injury or hazard.

CAUTION   It calls attention to an operation, if not correctly performed, could result in damage to the product or other devices connected to the product.

Safety Symbols on the Product:

| Hazardous Voltage | Safety Warning | Protective Earth Terminal | Chassis Ground | Test Ground |

Document Overview

Format Conventions in this Manual

1. **Key**
   The key on the front panel is denoted by the format of "Key Name (Bold) + Text Box" in the manual. For example, Utility denotes the "Utility" key.

2. **Menu**
   The menu items are denoted by the format of "Menu Word (Bold) + Character Shading". For example, **System** denotes the "System" menu item under Utility.

3. **Operation Procedures:**
   → denotes the next step of operation. For example, Utility → System denotes that first press Utility, and then press the **System** softkey.

Content Conventions in this Manual

MSO8000 series includes the following models. Unless otherwise specified, this manual takes MSO8204 (installed with the function/arbitrary waveform generator option) as an example to illustrate the disassembly and assembly of the MSO8000 series.

Model	Max. Analog Bandwidth	No. of Analog Channels	No. of Function/Arbitrary Waveform Generator Channels	No. of Digital Channels
MSO8064	600 MHz	4	2 (Opt.)	16 (Required to purchase the probe)
MSO8104	1 GHz	4	2 (Opt.)	16 (Required to purchase the probe)
MSO8204	2 GHz	4	2 (Opt.)	16 (Required to purchase the probe)

Manuals of this Product

The manuals of this product mainly include Quick Guide, User Guide, Programming Guide, Data Sheet, and etc. For the latest version of this manual, download it from the official website of RIGOL (www.rigol.com).

Contents

Chapter 1   Disassembly and Assembly

Notices to Disassembly and Assembly

Notices:

- Do not disassemble the instrument unless for working requirement.
- Only authorized personnel are allowed to disassemble the instrument.
- Cut off the power supply before disassembling the instrument.
- Please wear anti-static wrist strap or make other anti-static precaution when disassembling the instrument.
- Please use proper tools and follow the correct steps.
- Take care not to deform the metal structure or get hurt when disassembling the metal structures.
- To avoid causing damage to the instrument due to improper operation and to save your time, we recommend you to follow the disassembly steps and methods in this guide manual.

Required Tools:

- Phillips screwdriver T10
- BNC socket wrench

	WARNING
⚠	Ensure that the power supply is cut off before disassembling the instrument. Only well-trained professional personnel or qualified personnel are allowed to disassemble the instrument.

Exploded View Drawing

You need to get a basic understanding of the main parts of the instrument before disassembling and assembling the instrument. When disassembling or assembling the instrument, please follow the procedures and take care not to scratch the surfaces of the instrument. This manual mainly introduces the disassembly and assembly methods for the MSO8000 series digital oscilloscope. The exploded view drawing of MSO8000 (installed with the function/arbitrary waveform generator option) is shown in Figure 1-1. For the replacement parts list, refer to Table1-1.
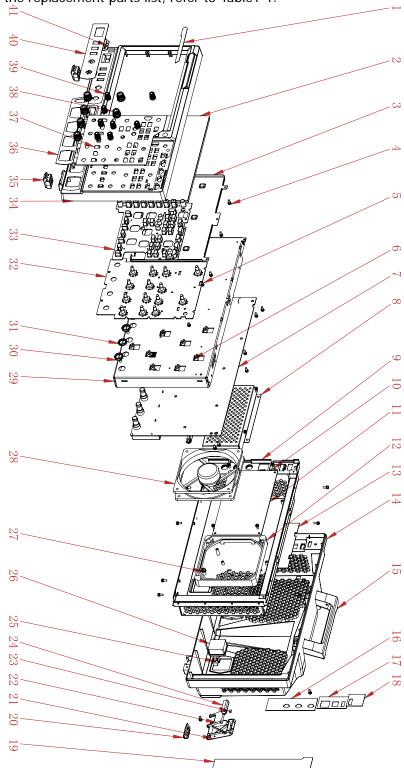

Figure 1-1 Exploded View Drawing of MSO8000 (Installed with the Function/AWG Option)

Table1-1 Replacement Parts List

No.	Part No.	Qty.	Name/Description
1	1020004447 (MSO8064) 1020004448 (MSO8104) 1020004449 (MSO8204)	1	Front Label
2	1010005810	1	LCD (Touch Screen Included)
3	1020003979	1	LCD Shield
4	1020000573	30	M3x8 Torx Pan Head Combination Screw
5	1020000571	13	M3x6 Torx Pan Head Combination Screw
6	1010005842	8	BeCu Fingerstock
7	2010004397	1	Main Board (MB_BOARD)
8	1020003981	1	Power Supply Shield
9	1020003988	1	Metal Rear Panel
10	1010005841	3	BeCu Fingerstock (Slot Mount)
11	2010003934	1	Power Supply Board
12	2010003933	1	Rubber Fan Sleeve
13	1020004108	1	Dustproof Mesh
14	2010003941	1	Rear Panel
15	2010003929	1	Handle
16	1020004004	1	BNC Back Label
17	1020004003	1	LAN Interface Back Label
18	1020004002	1	HDMI Rear Label
19	1020004001	1	Authentication Back Label
20	2010000322	2	Rear Bracket
21	2010003927	2	Main Rear Support Leg
22	2010003928	2	Auxiliary Rear Bracket
23	2010000183	4	Bracket Shaft
24	2010000324	2	Bracing Shaft Restrain Block
25	1010003552	1	Fuse
26	1010002562	1	Power Socket
27	1020000563	1	M4x8 Torx Pan Head Combination Screw
28	1020003467	1	Fan
29	1020003987	1	Metal Front Panel
30	1020000648	9	Lock Washer
31	1020000619	9	BNC Nut
32	2010004101	1	Keypad Board
33	1020003991	1	Main Key
34	2010003942	1	Panel
35	2010001009	2	Front Bracket
36	1020004032	1	BNC Label
37	1020004000	1	Controls Film
38	2010003945	6	Large Knob
39	2010003947	8	Small Knob
40	1020003999	1	Front Panel Interface/Connector Label
41	1020003967	1	Power Key

The recommended disassembly procedures are as follows:
Disassemble the Rear Panel Components → Disassemble the Front Bracket → Disassemble the Metal Rear Panel Components → Disassemble the Fan Components → Disassemble the Power Supply Shield → Disassemble the Power Supply Board → Disassemble the Metal Front Panel → Disassemble the Main Board → Disassemble the Knob → Disassemble the Keypad Board → Disassemble the LCD → Disassemble the Power Key

Disassemble the Rear Panel Components

Figure 1-2 Disassemble the Rear Panel Components

Part Description:
① 2 screws (M3x8 torx pan head combination screw, used for fastening the handle)
② 2 screws (M3x8 torx pan head combination screw, used for fastening the rear panel at the bottom)

Disassembly Steps:
1. Use the T10 screwdriver to remove 2 screws (①) that secure the handle.
2. Use the T10 screwdriver to remove 2 screws (②) at the bottom of the rear panel.
3. Remove the rear panel components in the arrow direction (as shown in the figure above).
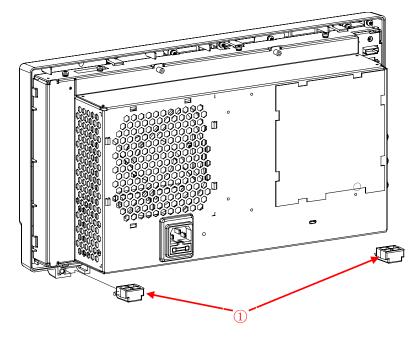
Disassemble the Front Bracket

Figure 1-3 Disassemble the Front Bracket

Part Description:
① 2 front brackets

Disassembly Step:
Take off the front brackets gently.

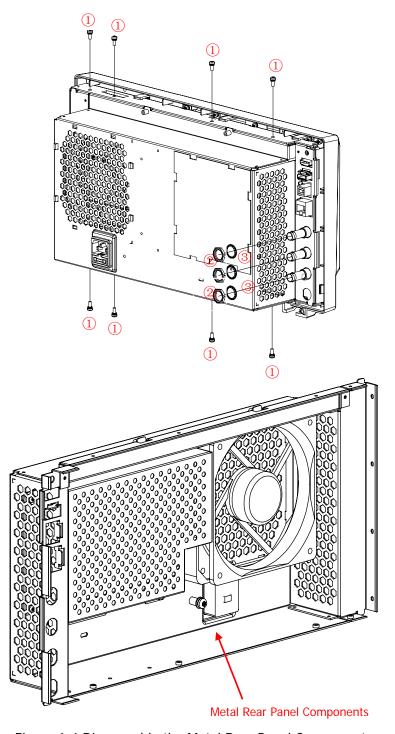# Disassemble the Metal Rear Panel Components

Figure 1-4 Disassemble the Metal Rear Panel Components

Part Description:

①   8 screws (M3x6 torx pan head combination screw, used for fastening the metal front panel and the metal rear panel components)

②   3 BNC nuts

③   3 lock washers

Disassembly Steps:
1. Use the BNC socket wrench to remove the 3 BNC nuts and 3 lock washers at the BNC connectors of the metal rear panel components.
2. Use the T10 screwdriver to remove 8 screws (①) that fasten the front metal panel and the metal rear panel components.
3. Disconnect the power cable and the fan cable from the main board.
4. Remove the metal rear panel components gently.

Tip
Before disconnecting the power cable and the fan cable from the main board, pay attention to the connecting positions of the cables to avoid incorrect connection or incomplete connection when assembling the cables.
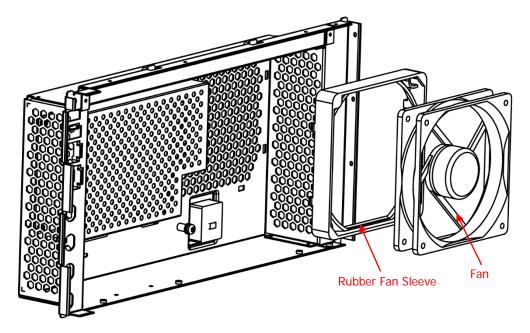

Disassemble the Fan Components

Figure 1-5 Disassemble the Fan Components

Disassembly Steps:
1. Remove the fan cable from the power supply shield.
2. Disengage the 4 tabs of the rubber fan sleeve from the metal rear panel components.
3. Remove the fan components (fan+rubber fan sleeve) from the metal rear panel components.
4. Take off the fan gently.

Tip
When disassembling the fan, pay attention to the installation position of the fan and the direction of the fan cable outlet to avoid any improper assembly operation.

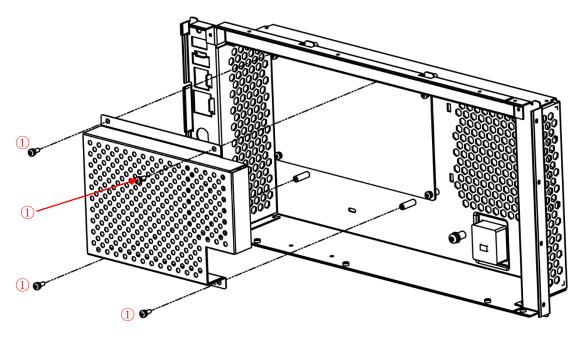# Disassemble the Power Supply Shield

Figure 1-6 Disassemble the Power Supply Shield

Part Description:

①   4 screws (M3x8 torx pan head combination screw, used for fastening the power supply shield)

Disassembly Steps:

1.   Use the T10 screwdriver to remove 4 screws (①) that secure the power supply shield.
2.   Take off the power supply shield gently.
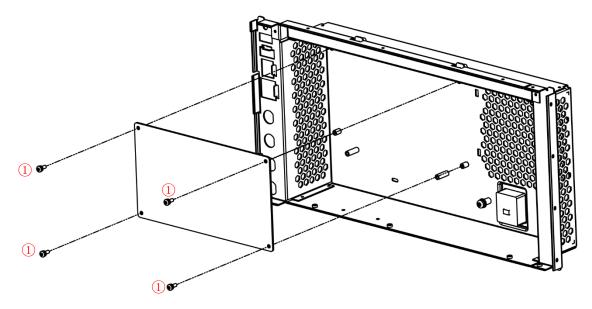
Disassemble the Power Supply Board

Figure 1-7 Disassemble the Power Supply Board

Part Description:
①   4 screws (M3x8 torx pan head combination screw, used for fastening the power supply board)

Disassembly Steps:
1.   Remove the AC line from the power supply board.
2.   Use the T10 screwdriver to remove 4 screws (①) that secure the power supply board.
3.   Take off the power supply board gently.

> **Tip**
> Before disconnecting the cables from the power supply board, pay attention to the connecting positions of the cables to avoid incorrect connection or incomplete connection when assembling the cables.
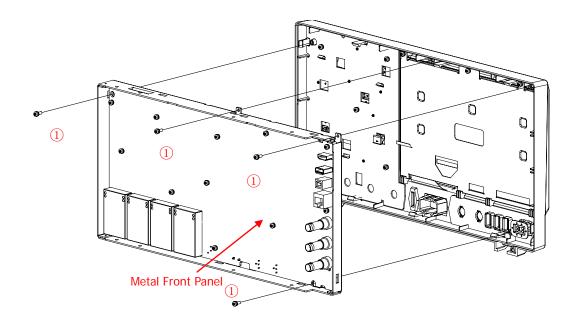
Disassemble the Metal Front Panel

Figure 1-8 Disassemble the Metal Front Panel

Part Description:
①   4 screws (M3x8 torx pan head combination screw, used for fastening the metal front panel)

Disassembly Steps:
1.   Use the T10 screwdriver to remove 4 screws (①) that secure the metal front panel.
2.   Remove the keyboard cable, active probe power cable, and LCD screen cable from the metal front panel.
3.   Disengage the 9 tabs from the metal front panel.
4.   Take off the metal front panel gently.

Tip
Before disconnecting the cables from the metal front panel, pay attention to the connecting positions of the cables to avoid incorrect connection or incomplete connection when assembling the cables.
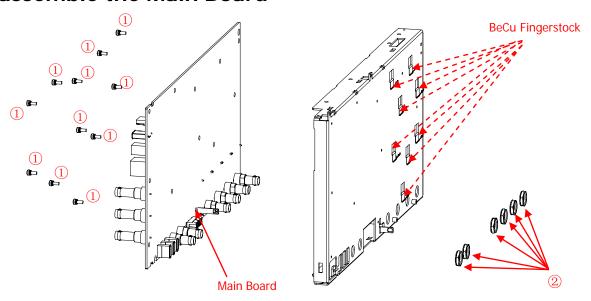

Disassemble the Main Board

Figure 1-9 Disassemble the Main Board

Part Description:
①   11 screws (M3x8 torx pan head combination screw, used for fastening the main board)
②   6 BNC nuts

Disassembly Steps:
1.   Use the BNC socket wrench to remove the 6 BNC nuts (②) at the BNC connectors of the main board.
2.   Use the T10 screwdriver to remove 11 screws (①) that secure the main board.
3.   Take off the main board gently.

Tip
After disassembling the metal front panel, take off the 8 BeCu fingerstocks. While assembling the BeCu fingerstocks, ensure that the slope side faces upward and make a proper installation.
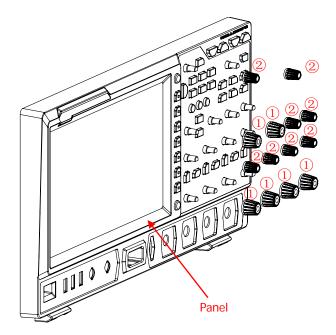

Disassemble the Knob

Figure 1-10 Disassemble the Knob

Part Description:
①   6 large knobs
②   8 small knobs

Disassembly Step:
Pull out the large and small knobs from the front panel.
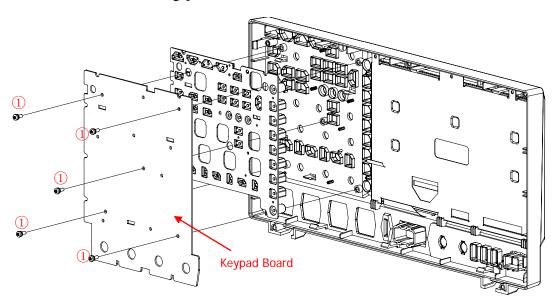
Disassemble the Keypad Board

Figure 1-11 Disassemble the Keypad Board

Part Description:
①   5 screws (M3x6 torx pan head combination screw, used for fastening the keypad board)

Disassembly Steps:
1.   Remove the active probe power cable and the touch screen cable from the keypad board.
2.   Use the T10 screwdriver to remove 5 screws (①) that secure the keypad board.
3.   Disengage the 3 tabs from the keypad board.
4.   Take off the keypad board gently.

Tip
● Before disconnecting the cables from the keypad board, pay attention to the connecting positions of the cables to avoid incorrect connection or incomplete connection when assembling the cables.
● When assembling the keyboard, align the keyboard with the slots on the front panel. After the keyboard is properly installed, ensure that all the rubber keypads on the front panel work normally.
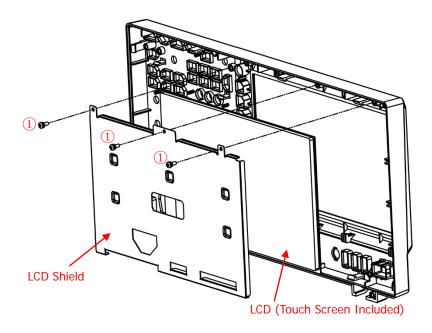

Disassemble the LCD

Figure 1-12 Disassemble the LCD

Part Description:
①   3 screws (M3x8 torx pan head combination screw, used for fastening the LCD assembly)

Disassembly Steps:
1.   Use the T10 screwdriver to remove 3 screws (①) that secure the LCD assembly (LCD+LCD shield).
2.   Move left and push outward the LCD assembly to take it off from the panel.

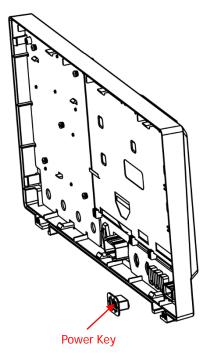# Disassemble the Power Key

Figure 1-13 Disassemble the Power Key

Disassembly Step:
Remove the Power key from the front panel.

Assembly Procedures

The assembly procedures are simply the reversal of the disassembly procedures. Check whether the cables are correctly connected and whether all the screws are installed after completing each assembly procedure.

Chapter 2   Troubleshooting&Maintenance

Basic Troubleshooting

The commonly encountered failures of the oscilloscope and their solutions are listed below. If the following problems occur, locate and resolve the problems according to the following steps. If the problems still persist, contact **RIGOL** and provide your instrument information to us.

1. **When I power on the instrument, the instrument stays black and does not display anything.**
   (1) Check whether the power switch is really on.
   (2) Check whether the power is correctly connected.
   (3) Check whether the fuse is blown. If you need to replace the fuse, use only the specified fuse that conforms to the product.
   (4) Restart the instrument after finishing the above inspections.
   (5) If the problem still persists, please contact **RIGOL**.

2. **No waveform of the signal is displayed on the screen.**
   (1) Check whether the probe is properly connected to the item under test.
   (2) Check whether there are signals generated from the item to be tested (you can connect the probe compensation output signal to the faulty channel to locate the problem, and then determine whether the channel or the item to be tested has a problem).
   (3) Resample the signal.

3. **The display of waveform is ladder-like.**
   (1) The horizontal time base might be too low. Increase the horizontal time base to improve the display effects.
   (2) If the display type is "Vector", the lines between the sample points may cause ladder-like display results. Press **Display** → **Type** to select "Dots".

4. **The USB storage device cannot be recognized.**
   (1) Check whether the USB storage device can work normally.
   (2) Make sure the USB storage device used is FAT32-format Flash storage type, as this instrument does not support USB3.0 and hardware storage type USB storage device.
   (3) Check whether the capacity of the USB storage device is too large. It is recommended that the capacity of the USB storage device should not exceed 8 GB for this oscilloscope.
   (4) Restart the instrument and insert the USB storage device to check it.
   (5) If the USB storage device still cannot work normally, please contact **RIGOL**.

5. **The touch functions cannot be used normally.**
   (1) Check whether you have enabled the touch screen. If not, please press the front-panel touch screen switch key **Touch Lock** to enable the touch screen function.
   (2) Check whether the screen or your finger is stained with oil or sweat. If yes, please clean the screen or dry your hands.
   (3) Check whether there is a strong magnetic field around the instrument. If the instrument is close to the strong magnetic field (e.g. a magnet), please move the instrument away from the magnet field.
   (4) If the problem still persists, please contact **RIGOL**.

Maintenance

System Maintenance

In order to ensure the performance and prolong the service life of the instrument, please follow the recommendations below.

1. Get a full understanding of the instrument performance and its basic operating method before using it.

2. In order to ensure the measurement accuracy and prolong the service life of the instrument, protect the instrument against dust, shock, moisture, magnetic field, and static electricity. Moreover, the instrument should not be exposed to sunlight for long periods of time.

3. Do not operate the instrument with functional failures. If a certain function of the instrument fails to work normally during its operating period, locate the problem and resolve it, then you can continue to operate the instrument. Besides, regular test and calibration should be performed to ensure the accuracy of its performance.

4. Arrange the instrument properly after you complete the operation.

5. Keep instrument accessories properly for future use.

Warranty

RIGOL (SUZHOU) TECHNOLOGIES INC. (hereinafter referred to as **RIGOL**) warrants that the product will be free from defects in materials and workmanship within the warranty period. If a product proves defective within the warranty period, **RIGOL** guarantees free replacement or repair for the defective product.

To get repair service, please contact with your nearest **RIGOL** sales or service office.

There is no other warranty, expressed or implied, except such as is expressly set forth herein or other applicable warranty card. There is no implied warranty of merchantability or fitness for a particular purpose. Under no circumstances shall **RIGOL** be liable for any consequential, indirect, ensuing, or special damages for any breach of warranty in any case.

Care and Cleaning

Care
Do not store or leave the instrument where it may be exposed to direct sunlight for long periods of time.

Cleaning
Clean the instrument regularly according to its operating conditions.
1. Disconnect the instrument from all power sources.
2. Clean the external surfaces of the instrument with a soft cloth dampened with mild detergent or water. Avoid having any water or other objects into the chassis via the heat dissipation hole. When cleaning the LCD, take care to avoid scarifying it.

⚠ **CAUTION**
To avoid damage to the instrument, do not expose it to caustic liquids.

⚠ **WARNING**
To avoid short-circuit resulting from moisture or personal injuries, ensure that the instrument is completely dry before connecting it to the power supply.

Environmental Considerations

The following symbol indicates that this product complies with the WEEE Directive 2002/96/EC.

Product End-of-Life Handling
The equipment may contain substances that could be harmful to the environment or human health. To avoid the release of such substances into the environment and avoid harm to human health, we recommend you to recycle this product appropriately to ensure that most materials are reused or recycled properly. Please contact your local authorities for disposal or recycling information.